10

15



What is Claimed is:

1. A compound which has the structure

$$\begin{array}{c|c}
R^{2a} & R^{2b} \\
R^{2a} & R^{2b} \\
R^{2c} & R^{2c}
\end{array}$$

$$\begin{array}{c|c}
(CH_2)_x & Z^{2c} \\
R^{2c} & R^{2c}
\end{array}$$

$$\begin{array}{c|c}
(CH_2)_m & (CH_2)_m
\end{array}$$

wherein x is 1,2, 3 or 4; m is 1 or 2; n is 1 or 2;

Q is C or N;

A is O or S;

Z is O or a bond;

R<sup>1</sup> is H or lower alkyl;

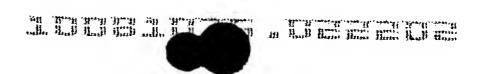
X is CH or N;

R<sup>2</sup> is H, alkyl, alkoxy,/halogen, amino or substituted amino;

R<sup>2a</sup>, R<sup>2b</sup> and R<sup>2c</sup> are the same or different and are selected from H, alkyl, alkoxy, halogen, amino or substituted amino;

R<sup>3</sup> is H, alkyl, arylalkyl, aryloxycarbonyl, alkyloxycarbonyl, alkynyloxycarbonyl, alkenyloxycarbonyl, arylcarbonyl, alkylcarbonyl, aryl, heteroaryl,

- alkyl(halo)aryloxycarbonyl, alkyloxy(halo)aryloxycarbonyl cycloalkylaryloxycarbonyl, cycloalkyloxyaryloxycarbonyl, cycloheteroalkyl, heteroarylcarbonyl, heteroaryl-heteroarylalkyl, alkylcarbonylamino, arylcarbonylamino, heteroarylcarbonylamino, alkoxycarbonylamino,
- aryloxycarbonylamino, heteroaryloxycarbonylamino, heteroaryl-heteroarylcarbonyl, alkylsulfonyl, alkenylsulfonyl, heteroaryloxycarbonyl, cycloheteroalkyloxycarbonyl, heteroarylalkyl, aminocarbonyl, substituted aminocarbonyl,
- alkylaminocarbonyl, arylaminocarbonyl, heteroarylalkenyl, cycloheteroalkylheteroarylalkyl, hydroxyalkyl, alkoxy, alkoxyaryloxycarbonyl, arylalkyloxycarbonyl, alkylaryloxycarbonyl, arylheteroarylalkyl, arylalkylarylalkyl, aryloxyarylalkyl, alkynyloxycarbonyl,



haloalkoxyaryloxycarbonyl, alkoxycarbonylaryloxycarbonyl, aryloxyaryloxycarbonyl, arylsulfinylarylcarbonyl, arylthioarylcarbonyl, alkoxycarbonylaryloxycarbonyl, arylalkenyloxycarbonyl, heteroaryloxyarylalkyl, aryloxyarylcarbonyl, aryloxyarylalkyloxycarbonyl, arylalkenyloxycarbonyl, arylalkylcarbonyl, aryloxyalkyloxycarbonyl arylalkylşulfonyl, arylthiocarbonyl, arylalkenylsulfonyl, hateroarylsulfonyl, arylsulfonyl, alkoxyarylalkyl, heteroarylalkoxycarbonyl, aryl/heteroarylalkyl, 10 alkoxyarylcarbonyl, aryloxyheteroarylalkyl, heteroarylalkyloxyarylalkyl, arylarylalkyl, arylalkenylarylalkyl, arylalkoxyarylalkyl, arylcarbonylarylalkyl, a/kylaryloxyarylalkyl, arylalkoxycarbonylheteroarylalkyl, heteroarylarylalkyl, arylcarbonylheteroary/alkyl, heteroaryloxyarylalkyl,

15 arylalkenylheteroary/alkyl, arylaminoarylalkyl or aminocarbonylarylarylalkyl;

Y is CO<sub>2</sub>R<sup>4</sup> /where R<sup>4</sup> is H or alkyl, or a prodrug ester) or Y is a/C-linked 1-tetrazole, a phosphinic acid of the structure P(O)(OR4a)R5, (where R4a is H or a prodrug ester, R<sup>5</sup> is a/1kyl or aryl) or a phosphonic acid of the structure  $P(\emptyset)$  (OR<sup>4a</sup>)<sub>2</sub>, (where R<sup>4a</sup> is H or a prodrug ester);

including all stereoisomers thereof, prodrug esters the feof, and pharmaceutically acceptable salts 25. thereof, with the proviso that where X is CH, A is O, Q is C,  $\mathbb{Z}/\text{is}$  O and Y is  $\mathbb{CO}_2\mathbb{R}^4$ , then  $\mathbb{R}^3$  is other than H or alkyl containing 1 to 5 carbons in the normal chain.

or

20

A compound having the structure



$$R^{2h}$$
 $R^{2a}$ 
 $R^{2a}$ 

$$\begin{array}{c|c}
R^{2b} & R^{2a} \\
R^{2c} & R^{2} \\
R^{2c} & R^{2c} \\
R^{2c} & R^{2c} & R^{2c} & R^{2c} & R^{2c} \\
R^{2c} & R^{2c} & R^{2c} & R^{2c} & R^{2c} \\
R^{2c} & R^{2c} & R^{2c} & R^{2c} & R^{2c} \\
R^{2c} & R^{2c} & R^{2c} & R^{2c} & R^{2c} \\
R^{2c} & R^{2c} & R^{2c} & R^{2c} & R^{2c} \\
R^{2c} & R^{2c} & R^{2c} & R^{2c} & R^{2c} \\
R^{2c} & R^{2c} & R^{2c} & R^{2c} & R^{2c} \\
R^{2c} & R^{2c} & R^{2c} & R^{2c} & R^{2c} \\
R^{2c} & R^{2c} & R^{2c} & R^{2c} & R^{2c} \\
R^{2c} & R^{2c} & R^{2c} & R^{2c} & R^{2c} \\
R^{2c} & R^{2c} & R^{2c} & R^{2c} & R^{2c} & R^{2c} \\
R^{2c} & R^{2c} & R^{2c} & R^{2c} & R^{2c} & R^{2c} \\
R^{2c} & R^{2c} & R^{2c} & R^{2c} & R^{2c} & R^{2c} & R^{2c} \\
R^{2c} & R^{2c} \\
R^{2c} & R^{2c} \\
R^{2c} & R^{2c$$

3. The compound as defined in Claim 1 having the structure

$$R^{2a}$$
 $R^{2b}$ 
 $R^{2a}$ 
 $R$ 

4. The compound as defined in Claim 1 having structure

$$(CH_2)_{x} CO_2R^4$$

$$(CH_2)_{x} CO_2R^4$$

$$(CH_2)_{x} CO_2R^4$$

$$(CH_2)_{x} CO_2R^4$$

$$(CH_2)_{x} CO_2R^4$$

5. The compound as defined in Claim 1 wherein  $(CH_2) \times is$  alkylene, alkenylene, allenyl, or alkynylene.

6. The compound as defined in Claim 4 wherein X is CH.

7. The compound as defined in Claim 4 wherein X 20 is N.

5

10

8. The compound as defined in Claim 1 having the structure

$$\begin{array}{c|c}
 & & & \\
 & & & \\
 & & & \\
 & & & \\
 & & & \\
 & & & \\
 & & & \\
 & & & \\
 & & & \\
 & & & \\
 & & & \\
 & & & \\
 & & & \\
 & & & \\
 & & & \\
 & & & \\
 & & & \\
 & & & \\
 & & & \\
 & & & \\
 & & & \\
 & & & \\
 & & & \\
 & & & \\
 & & & \\
 & & & \\
 & & & \\
 & & & \\
 & & & \\
 & & & \\
 & & & \\
 & & & \\
 & & & \\
 & & & \\
 & & & \\
 & & & \\
 & & & \\
 & & & \\
 & & & \\
 & & & \\
 & & & \\
 & & & \\
 & & & \\
 & & & \\
 & & & \\
 & & & \\
 & & & \\
 & & & \\
 & & & \\
 & & & \\
 & & & \\
 & & & \\
 & & & \\
 & & & \\
 & & & \\
 & & & \\
 & & & \\
 & & & \\
 & & & \\
 & & & \\
 & & & \\
 & & & \\
 & & & \\
 & & & \\
 & & & \\
 & & & \\
 & & & \\
 & & & \\
 & & & \\
 & & & \\
 & & & \\
 & & & \\
 & & & \\
 & & & \\
 & & & \\
 & & & \\
 & & & \\
 & & & \\
 & & & \\
 & & & \\
 & & & \\
 & & & \\
 & & & \\
 & & & \\
 & & & \\
 & & & \\
 & & & \\
 & & & \\
 & & & \\
 & & & \\
 & & & \\
 & & & \\
 & & & \\
 & & & \\
 & & & \\
 & & & \\
 & & & \\
 & & & \\
 & & & \\
 & & & \\
 & & & \\
 & & & \\
 & & & \\
 & & & \\
 & & & \\
 & & & \\
 & & & \\
 & & & \\
 & & & \\
 & & & \\
 & & & \\
 & & & \\
 & & & \\
 & & & \\
 & & & \\
 & & & \\
 & & & \\
 & & & \\
 & & & \\
 & & & \\
 & & & \\
 & & & \\
 & & & \\
 & & & \\
 & & & \\
 & & & \\
 & & & \\
 & & & \\
 & & & \\
 & & & \\
 & & & \\
 & & & \\
 & & & \\
 & & & \\
 & & & \\
 & & & \\
 & & & \\
 & & & \\
 & & & \\
 & & & \\
 & & & \\
 & & & \\
 & & & \\
 & & & \\
 & & & \\
 & & & \\
 & & & \\
 & & & \\
 & & & \\
 & & & \\
 & & & \\
 & & & \\
 & & & \\
 & & & \\
 & & & \\
 & & & \\
 & & & \\
 & & & \\
 & & & \\
 & & & \\
 & & & \\
 & & & \\
 & & & \\
 & & & \\
 & & & \\
 & & & \\
 & & & \\
 & & & \\
 & & & \\
 & & & \\
 & & & \\
 & & & \\
 & & & \\
 & & & \\
 & & & \\
 & & & \\
 & & & \\
 & & & \\
 & & & \\
 & & & \\
 & & & \\
 & & & \\
 & & & \\
 & & & \\
 & & & \\
 & & & \\
 & & & \\
 & & & \\
 & & & \\
 & & & \\
 & & & \\
 & & & \\
 & & & \\
 & & & \\
 & & & \\
 & & & \\
 & & & \\
 & & & \\
 & & & \\
 & & & \\
 & & & \\
 & & & \\
 & & & \\
 & & & \\
 & & & \\
 & & & \\
 & & & \\
 & & & \\
 & & & \\
 & & & \\
 & & & \\
 & & & \\
 & & & \\
 & & & \\
 & & & \\
 & & & \\
 & & & \\
 & & & \\
 & & & \\
 & & \\
 & & & \\
 & & & \\
 & & & \\
 & & & \\
 & & & \\
 & & & \\
 & &$$

wherein R<sup>1</sup> is alkyl, R<sup>3b</sup> is arylalkylamino, arylarylamino, arylamino, alkoxyarylamino, dialkoxyarylamino, dihaloarylamino or alkylthioarylamino.

9. The compound as defined in Claim 1 having the structure

$$(CH_2)_{x} = (CH_2)_{x} + (CH_2)_{n} - CO_2H$$

10

10. The compound as defined in Claim 1 wherein  $\mathbb{R}^{2a}$  is alkoxy or  $\mathbb{N}$ .

 $(CH_2)_x$  is  $CH_2$ ,  $(CH_2)_2$ ,  $(CH_2)_3$ , or  $CH_3$ ,  $(CH_2)_m$  is  $CH_2$ , or

CH— (where  $R_a$  is alkyl or alkenyl),  $(CH_2)_n$  is  $CH_2$ ,  $R^1$  is lower alkyl, preferably  $-CH_3$ ,  $R^2$  is H,  $R^{2a}$  is H,  $R^4$  is H, X is CH, and  $R^3$  is arylalkyloxycarbonyl, arylakyl, arylakyl, arylakyl, aryloxycarbonyl, haloaryl-oxycarbonyl,

- alkoxyaryloxycarbonyl, alkylaryloxycarbonyl, aryloxyaryloxycarbonyl, heteroaryloxyarylalkyl, heteroaryloxycarbonyl, aryloxyarylcarbonyl, arylalkenyloxycarbonyl, cycloalkylaryloxycarbonyl, arylalkylarylcarbonyl, heteroaryl-heteroarylalkyl,
- 25 cycloalkyloxyaryloxycarbonyl, heteroarylheteroarylcarbonyl, alkyloxyaryloxycarbonyl,
  arylalkylsulfonyl, arylalkenylsulfonyl, alkoxyarylalkyl,
  arylthiocarbonyl, cycloheteroalkylalkyloxycarbonyl,
  cycloheteroalkyloxycarbonyl, or polyhaloalkylaryloxy-

30 carbonyl, which may be optionally substituted.

15

11. The compound as defined in Claim 5 wherein  $\boldsymbol{X}$  is CH.

5 12. The compound as defined in Claim 5 wherein X is N.

13. The compound as defined in Claim 1 wherein x is 2, m is 1, and n is 1.

14. The compound as defined in Claim 1 having the structure

15. The compound as defined in Claim 1 having the structure

where  $(CH_2)_n$  is  $CH_2$  or — CH—.

16. The compound as defined in Claim 1 having the structure

$$\begin{array}{c|c} Ph & \\ \hline \\ CH_3 & \\ \end{array}$$

$$\begin{array}{c|c} Ph \\ \hline \\ CH_3 \end{array}$$

$$\begin{array}{c} Ph \\ \longrightarrow \\ CH_3 \end{array}$$

$$\begin{array}{c|c} Ph \\ \hline \\ O \\ CH_3 \end{array}$$

15

5

- 330 -

10

Sub A5 cont.

Sub A5 Cont.

Cont.

Cont.

OCH<sub>3</sub> .OCH<sub>3</sub> OCH<sub>3</sub> COCH3, OCH<sub>3</sub> OCH<sub>3</sub> OCH<sub>3</sub> 5 OCH<sub>3</sub> OCH<sub>3</sub> Br CH<sub>3</sub> CI 10 CH<sub>3</sub> CH<sub>3</sub> ĊH<sub>3</sub> ĊH<sub>3</sub> 15

- 344 -

10

ĊH3

15

5 10 CH<sub>3</sub> ĊO₂H Ph

, where  $R^3 =$ 

15

10

Sub As. com.

Sub As com.



.

Sub As Cont.



$$\begin{array}{c|c} CH_3 & CO_2H \\ \hline \\ Ph & O & O \\ \hline \\ N & O \end{array}$$

Sub As com.

- 352 -

LA29a CIP

10

- 356 -



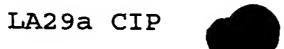
As Cons.

17. The compound as defined in Claim 1 having the structure









18. The compound as defined in Claim 1 having the structure

OCH3

OCH3

10

Sus. As

19. The compound as defined in Claim 1 having the 5 structure

20. The compound as defined in Claim 1 having the structure

10 A6

$$\begin{array}{c|c} Ph & & \\ O & & \\ O & & \\ CH_3 & & \\ \end{array}$$

10

- 366 -



Ph N 
$$CH_3$$

Ph N  $CH_3$ 

Ph N





OCH3

CO<sub>2</sub>H

CO<sub>2</sub>H

ÓCH3

ÇH₃

CO<sub>2</sub>H

ÖCH<sub>3</sub>

OCH<sub>3</sub> CO<sub>2</sub>H ĊO₂H OCH<sub>3</sub> ÇH<sub>3</sub> ĊO₂H ĊO<sub>2</sub>H CO<sub>2</sub>H CH<sub>3</sub> ÓCH3 ÇH<sub>3</sub> CO<sub>2</sub>H ĊO₂H ÇH<sub>3</sub> CH<sub>3</sub> CO<sub>2</sub>H ĊO₂H



$$Ar = CI \longrightarrow F_3C \longrightarrow F_3C$$

21. The compound as defined in Claim 1 having the

5 structure

10

22. The compound as defined in Claim 1 having the structure

23. The compound as defined in Claim 1 having the structure

OCH<sub>3</sub>

24. The compound as defined in Claim 1 having the structure

5

25. The compound as defined in Claim 1 having the structure

10

26. The compound as defined in Claim 1 having the structure



27. The compound as defined in Claim 1 having the structure

28. The compound as defined in Claim 1 having the structure

10 29. The compound as defined in Claim 1 having the structure

30. The compound as defined in Claim 1 having the

31. The compound as defined in Claim 1 having the structure

32. The compound as defined in Claim 1 having the structure

33. A pharmaceutical composition comprising a compound as defined in Claim 1 and a pharmaceutically acceptable carrier therefor.

34. A method for lowering blood glucose levels which comprises administering to a patient in need of treatment a therapeutically effective amount of a compound as defined in Claim 1.

- 35. A method for treating diabetes which comprises administering to a patient in need of treatment a therapeutically effective amount of a compound as defined in Claim 1.
- 36. A method for treating a premalignant disease, an early malignant disease, a malignant disease, or a dysplastic disease, which comprises administering to a patient in need of treatment a therapeutically effective amount of a compound as defined in Claim 1.



Sub S

10

- 37. A pharmaceutical combination comprising a compound as defined in Claim 1 and a lipid-lowering agent, a lipid modulating agent, an antidiabetic agent, an anti-obesity agent, an antihypertensive agent, a platelet aggregation inhibitor, and/or an antiosteoporosis agent
- 38. The pharmaceutical combination as defined in Claim 37 comprising said compound and an antidiabetic agent.

Sub All 15

- 39. The combination as defined in Claim 38 wherein the antidiabetic agent is 1, 2, 3 or more of a biguanide, a sulfonyl wrea, a glucosidase inhibitor, a PPAR $\alpha$  agonist, a PPAR $\alpha$  agonist, a PPAR $\alpha$  agonist, a PPAR $\alpha$  dual agonist, an SGLT2 inhibitor, a DP4 inhibitor, an aP2 inhibitor, an insulin sensitizer, a glucagon-like peptide-l (GLP-l), insulin and/or a meglitinide.
- 40. The combination as defined in Claim 39 wherein the antidiabetic agent is 1, 2, 3 or more of metformin, glyburide, glimepiride, glipyride, glipizide, chlorpropamide, gliclazide, acarbose, miglitol, pioglitazone, troglitazone, rosiglitazone, insulin, Gl-25 262570, isaglitazone, JTT-501, NN-2344, L895645, YM-440, R-119702, AJ9677, repaglinide, nateglinide, KAD1129, AR-HO39242, GW-409544, KRP297, AC2993, LY315902, P32/98 and/or NVP-DPP-728A.
- 41. The combination as defined in Claim 38 wherein the compound is present in a weight ratio to the antidiabetic agent within the range from about 0.001 to about 100:1.
- 35 42. The combination as defined in Claim 37 wherein the anti-obesity agent is a beta 3 adrenergic agonist, a lipase inhibitor, a serotonin (and dopamine) reuptake

35



inhibitor, a thyroid receptor agonist, an aP2 inhibitor and/or an anorectic agent.

- 43. The combination as defined in Claim 42 wherein the anti-obesity agent is orlistat, ATL-962, AJ9677, L750355, CP331648, sibutramine, topiramate, axokine, dexamphetamine, phentermine, phenylpropanolamine, and/or mazindol.
- 10 44. The combination as defined in Claim 37 wherein the lipid lowering agent is an MTP inhibitor, an HMG CoA reductase inhibitor, a squalene synthetase inhibitor, a fibric acid derivative, an upregulator of LDL receptor activity, a lipoxygenase inhibitor, or an ACAT inhibitor.
- 45. The combination as defined in Claim 44 wherein the lipid lowering agent is pravastatin, lovastatin, simvastatin, atorvastatin, carivastatin, fluvastatin, itavastatin, visastatin, fenofibrate, gemfibrozil, clofibrate, avasimibe, TS-962, MD-700, cholestagel, niacin and/or LY295427.
- 46. The combination as defined in Claim 44 wherein the compound is present in a weight ratio to the lipid25 lowering agent within the range from about 0.001:1 to about 100:1.
- 47. The combination as defined in Claim 37 wherein the antihypertensive agent is an ACE inhibitor, angiotensin II receptor antagonist, NEP/ACE inhibitor, calcium channel blocker and/or  $\beta$ -adrenergic blocker.
  - 48. The combination as defined in Claim 47 wherein the antihypertensive agent is an ACE inhibitor which is captopril, fosinopril, enalapril, lisinopril, quinapril, benazepril, fentiapril, ramipril or moexipril; an NEP/ACE inhibitor which is omapatrilat, [S[(R\*,R\*)]-hexahydro-6-



[(2-mercapto-1-oxo-3-phenylpropyl)amino]-2,2-dimethyl-7-oxo-1H-azepine-1-acetic acid (gemopatrilat) or CGS 30440;

an angiotensin II receptor antagonist which is irbesartan, losartan or valsartan;

amlodipine besylate, prazosin HCl, verapamil, nifedipine, nadolol, propranolol, carvedilol, or clonidine HCl.

- 49. The combination as defined in Claim 37 wherein the platelet aggregation inhibitor is aspirin, clopidogrel, ticlopidine, dipyridamole or ifetroban.
  - 50. A method for treating insulin resistance, hyperglycemia, hyperinsulinemia, or elevated blood levels of free fatty acids or glycerol, hyperlipidemia, obesity, Syndrome X, dysmetabolic syndrome, inflammation, diabetic complications, impaired glucose homeostasis, impaired glucose tolerance, hypertriglyceridemia or atherosclerosis which comprises administering to a mammalian species in need of treatment a therapeutically effective amount of a pharmaceutical combination as defined in Claim 43.
- 51. A method for treating irritable bowel

  25 syndrome, Crohn's disease, gastric ulceritis or

  osteroporosis, or psoriasis, which comprises

  administering to a mammalian species in need of treatment

  a therapeutically effective amount of a compound as

  defined in Claim 1.
  - 52. The method as defined in Claim 36 wherein the disease is a liposarcoma or an epithelial tumor.
- 53. The method as defined in Claim 52 wherein the epithelial tumor is a tumor of the breast, prostate, colon, ovaries, stomach or lung.

Sib 15 A12

20

30



54. The method as defined in Claim 36 wherein the disease is ductal carcinoma in situ of the breast, lobular carcinoma in situ of the breast, fibroadenoma of the breast, or prostatic intraepithelial neoplasia.

5

- 383 -